1890 EL CAMINO REAL PROJECT ENVIRONMENTAL NOISE ASSESSMENT

Santa Clara, California

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Prepared for:

Audrey M. Zagazeta
Circlepoint
40 A/B South 1st Street
San José, CA 95113

Prepared by:

Carrie J. Janello

ILLINGWORTH & RODKIN, INC.
Acoustics • Air Quality
1 Willowbrook Court, Suite 120
Petaluma, CA 94954
(707) 794-0400

Project: 15-254

INTRODUCTION

A mixed-use development project has been proposed at 1890 El Camino Real in Santa Clara, California. The proposed four-story building would include 5,800 square feet of commercial space and a 45,287 square-foot parking garage on the first floor and a total of 60 residential units on floors two through four. Currently, the project site consists of a used car dealership, a tire shop, and a real estate office.

This report evaluates the project's potential to result in significant impacts with respect to applicable CEQA guidelines. The report is divided into two sections: 1) the Setting Section provides a brief description of the fundamentals of environmental noise, summarizes applicable regulatory criteria, and discusses the results of the ambient noise monitoring survey completed to document existing noise conditions; and 2) the Impacts and Mitigation Measures Section describes the significance criteria used to evaluate project impacts, provides a discussion of each project impact, and presents mitigation measures, where necessary, to provide a compatible project in relation to adjacent noise sources and land uses.

SETTING

Fundamentals of Environmental Noise

Noise may be defined as unwanted sound. Noise is usually objectionable because it is disturbing or annoying. The objectionable nature of sound could be caused by its *pitch* or its *loudness*. *Pitch* is the height or depth of a tone or sound, depending on the relative rapidity (*frequency*) of the vibrations by which it is produced. Higher pitched signals sound louder to humans than sounds with a lower pitch. *Loudness* is intensity of sound waves combined with the reception characteristics of the ear. Intensity may be compared with the height of an ocean wave in that it is a measure of the amplitude of the sound wave.

In addition to the concepts of pitch and loudness, there are several noise measurement scales which are used to describe noise in a particular location. A *decibel (dB)* is a unit of measurement which indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 decibels represents a ten-fold increase in acoustic energy, while 20 decibels is 100 times more intense, 30 decibels is 1,000 times more intense, etc. There is a relationship between the subjective noisiness or loudness of a sound and its intensity. Each 10 decibel increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. Technical terms are defined in Table 1.

There are several methods of characterizing sound. The most common in California is the *A-weighted sound level (dBA).* This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in Table 2. Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying

events. This *energy-equivalent sound/noise descriptor* is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

The scientific instrument used to measure noise is the *sound level meter*. Sound level meters can accurately measure environmental noise levels to within about plus or minus 1 dBA. Various computer models are used to predict environmental noise levels from sources, such as roadways and airports. The accuracy of the predicted models depends upon the distance the receptor is from the noise source. Close to the noise source, the models are accurate to within about plus or minus 1 to 2 dBA.

Since the sensitivity to noise increases during the evening and at night -- because excessive noise interferes with the ability to sleep -- 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The *Community Noise Equivalent Level* (*CNEL*) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 p.m. - 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. - 7:00 a.m.) noise levels. The *Day/Night Average Sound Level* (L_{dn}) is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Fundamentals of Ground-borne Vibration

Ground vibration consists of rapidly fluctuating motions or waves with an average motion of zero. Several different methods are typically used to quantify vibration amplitude. One method is the Peak Particle Velocity (PPV). The PPV is defined as the maximum instantaneous positive or negative peak of the vibration wave. In this report, a PPV descriptor with units of mm/sec or in/sec is used to evaluate construction generated vibration for building damage and human complaints. Table 3 displays the reactions of people and the effects on buildings that continuous vibration levels produce.

The annoyance levels shown in Table 3 should be interpreted with care since vibration may be found to be annoying at much lower levels than those shown, depending on the level of activity or the sensitivity of the individual. To sensitive individuals, vibrations approaching the threshold of perception can be annoying. Low-level vibrations frequently cause irritating secondary vibration, such as a slight rattling of windows, doors, or stacked dishes. The rattling sound can give rise to exaggerated vibration complaints, even though there is very little risk of actual structural damage.

Construction activities can cause vibration that varies in intensity depending on several factors. The use of pile driving and vibratory compaction equipment typically generates the highest construction related ground-borne vibration levels. Because of the impulsive nature of such activities, the use of the PPV descriptor has been routinely used to measure and assess ground-borne vibration and almost exclusively to assess the potential of vibration to induce structural damage and the degree of annoyance for humans.

The two primary concerns with construction-induced vibration, the potential to damage a structure and the potential to interfere with the enjoyment of life, are evaluated against different

vibration limits. Studies have shown that the threshold of perception for average persons is in the range of 0.008 to 0.012 in/sec PPV. Human perception to vibration varies with the individual and is a function of physical setting and the type of vibration. Persons exposed to elevated ambient vibration levels, such as people in an urban environment, may tolerate a higher vibration level.

Structural damage can be classified as cosmetic only, such as minor cracking of building elements, or may threaten the integrity of the building. Safe vibration limits that can be applied to assess the potential for damaging a structure vary by researcher and there is no general consensus as to what amount of vibration may pose a threat for structural damage to the building. Construction-induced vibration that can be detrimental to the building is very rare and has only been observed in instances where the structure is at a high state of disrepair and the construction activity occurs immediately adjacent to the structure.

TABLE 1 Definition of Acoustical Terms Used in this Report

Term	Definition
Decibel, dB	A unit describing, the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure. The reference pressure for air is 20 micro Pascals.
Sound Pressure Level	Sound pressure is the sound force per unit area, usually expressed in micro Pascals (or 20 micro Newtons per square meter), where 1 Pascal is the pressure resulting from a force of 1 Newton exerted over an area of 1 square meter. The sound pressure level is expressed in decibels as 20 times the logarithm to the base 10 of the ratio between the pressures exerted by the sound to a reference sound pressure (e. g., 20 micro Pascals). Sound pressure level is the quantity that is directly measured by a sound level meter.
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure. Normal human hearing is between 20 Hz and 20,000 Hz. Infrasonic sound are below 20 Hz and Ultrasonic sounds are above 20,000 Hz.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1%, 10%, 50%, and 90% of the time during the measurement period.
Day/Night Noise Level, L_{dn} or DNL	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m.to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Handbook of Acoustical Measurements and Noise Control, Harris, 1998.

TABLE 2 Typical Noise Levels in the Environment

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110 dBA	Rock band
Jet fly-over at 1,000 feet		
	100 dBA	
Gas lawn mower at 3 feet		
	90 dBA	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80 dBA	Garbage disposal at 3 feet
Noisy urban area, daytime		
Gas lawn mower, 100 feet	70 dBA	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	60 dBA	
		Large business office
Quiet urban daytime	50 dBA	Dishwasher in next room
Quiet urban nighttime	40 dBA	Theater, large conference room
Quiet suburban nighttime		
	30 dBA	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20 dBA	
		Broadcast/recording studio
	10 dBA	
	0 dBA	

Source: Technical Noise Supplement (TeNS), California Department of Transportation, September 2013.

TABLE 3 Reactions of People and Damage to Buildings from Continuous or Frequent Intermittent Vibration Levels

Velocity Level, PPV (in/sec)	Human Reaction	Effect on Buildings
0.01	Barely perceptible	No effect
0.04	Distinctly perceptible	Vibration unlikely to cause damage of any type to any structure
0.08	Distinctly perceptible to strongly perceptible	Recommended upper level of the vibration to which ruins and ancient monuments should be subjected
0.1	Strongly perceptible	Virtually no risk of damage to normal buildings
0.3	Strongly perceptible to severe	Threshold at which there is a risk of damage to older residential dwellings such as plastered walls or ceilings
0.5	Severe - Vibrations considered unpleasant	Threshold at which there is a risk of damage to newer residential structures

Source: Transportation and Construction Vibration Guidance Manual, California Department of Transportation, September 2013.

Regulatory Background - Noise

The State of California and the City of Santa Clara have established regulatory criteria that are applicable in this assessment. The State of California Environmental Quality Act (CEQA) Guidelines, Appendix G, are used to assess the potential significance of impacts pursuant to local General Plan policies, Municipal Code standards, or the applicable standards of other agencies. A summary of the applicable regulatory criteria is provided below.

State CEQA Guidelines. The CEQA contains guidelines to evaluate the significance of effects of environmental noise attributable to a proposed project. Under CEQA, noise impacts would be considered significant if the project would result in:

(a) Exposure of persons to or generation of noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;

(b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels;

(c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;

(d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;

(e) For a project located within an airport land use plan or where such a plan has not been adopted within two miles of a public airport or public use airport, if the project would expose people residing or working in the project area to excessive noise levels; or

(f) For a project within the vicinity of a private airstrip, if the project would expose people residing or working in the project area to excessive noise levels.

CEQA does not define what noise level increase would be considered substantial. Typically, project-generated noise level increases of 3 dBA L_{dn}/CNEL or greater would be considered significant where exterior noise levels would exceed the normally acceptable noise level standard (60 dBA L_{dn}/CNEL for residential land uses). Where noise levels would remain at or below the normally acceptable noise level standard with the project, noise level increases of 5 dBA L_{dn}/CNEL or greater would be considered significant.

2010 California Building Code. The State of California established exterior sound transmission control standards for new hotels, motels, dormitories, apartment houses, and dwellings other than detached single-family dwellings as set forth in the 2010 California Building Code (Chapter 12, Section 1207.11). Interior noise levels attributable to exterior environmental noise sources shall not exceed 45 dBA L_{dn}/CNEL in any habitable room. When exterior noise levels (the higher of existing or future) where residential structures are to be located exceed 60 dBA L_{dn}/CNEL, a report must be submitted with the building plans describing the noise control measures that have been incorporated into the design of the project to meet the noise limit. The 2013 California Building Code did not include the interior noise level threshold of 45 dBA L_{dn}/CNEL; however, the Initial Statement of Reasons for the change stated that the Department of Housing and Community Development (HCD) proposes to adopt a new section requiring interior noise levels attributable to exterior sources not to exceed 45 dB in any habitable room. Therefore, the interior noise threshold established in the 2010 California Building Code should still be applied to new buildings.

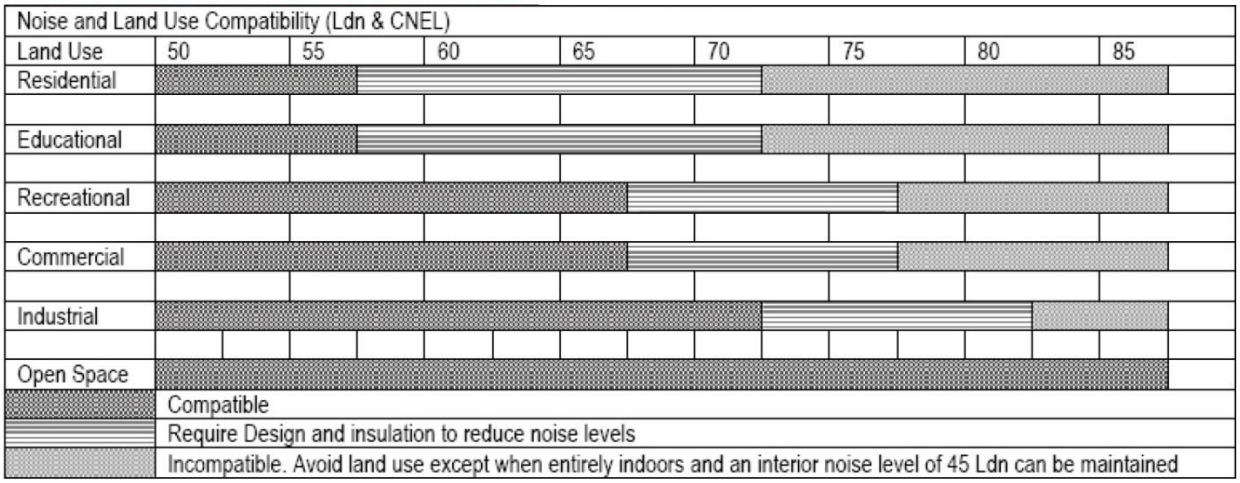
2010 California Green Building Standards Code. The State of California established exterior sound transmission control standards for new non-residential buildings as set forth in the 2010 California Green Building Standards Code (Section 5.507.4.1 and 5.507.4.2). These standards were not altered in the 2013 revisions, and the sections that pertain to this project are as follows:

5.507.4.1 Exterior noise transmission, prescriptive method. Wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall meet a composite STC rating of at least 50 or a composite OITC rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the building falls within the 65 dBA CNEL noise contour of a freeway or expressway, railroad, industrial source or fixed-guideway noise source, as determined by the local general plan noise element.

5.507.4.2 Performance method. For buildings located, as defined by Section 5.507.4.1, wall and roof-ceiling assemblies exposed to the noise source making up the building envelope shall be constructed to provide an interior noise environment attributable to exterior sources that does not exceed an hourly equivalent noise level ($L_{eq\ (1\text{-}hr)}$) of 50 dBA in occupied areas during any hour of operation.

City of Santa Clara General Plan. The City of Santa Clara's General Plan identifies noise and land use compatibility standards for various land uses and establishes policies to control noise within the community. Table 5.10-2 from the General Plan shows acceptable noise levels for various land uses. Residential land uses are considered compatible in noise environments of 55 dBA L_{dn}/CNEL or less. The guidelines state that where the exterior noise levels are greater than 55 dBA L_{dn}/CNEL and less than 70 dBA L_{dn}/CNEL, the design of the project should include measures to reduce noise levels to acceptable levels. Noise levels exceeding 70 dBA L_{dn}/CNEL at residential land uses are considered incompatible. Residential land uses proposed in noise environments exceeding 70 dBA L_{dn}/CNEL should generally be avoided, except when the residential use is entirely indoors and where interior noise levels can be maintained at 45 dBA L_{dn}/CNEL or less.

TABLE 5.10-2: GENERAL PLAN NOISE STANDARDS



Applicable goals and policies presented in the General Plan are as follows:

5.10.6-G1 Noise sources restricted to minimize impacts in the community.

5.10.6-G2 Sensitive uses protected from noise intrusion.

5.10.6-G3 Land use, development and design approvals that take noise levels into consideration.

5.10.6-P1 Review all land use and development proposals for consistency with the General Plan compatibility standards and acceptable noise exposure levels defined on Table 5.10-1.

5.10.6-P2 Incorporate noise attenuation measures for all projects that have noise exposure levels greater than General Plan "normally acceptable" levels, as defined on Table 5.10-1.

5.10.6-P3 New development should include noise control techniques to reduce noise to acceptable levels, including site layout (setbacks, separation and shielding),

building treatments (mechanical ventilation system, sound-rated windows, solid core doors and baffling) and structural measures (earthen berms and sound walls).

5.10.6-P4 Encourage the control of noise at the source through site design, building design, landscaping, hours of operation and other techniques.

5.10.6-P5 Require noise-generating uses near residential neighborhoods to include solid walls and heavy landscaping along common property lines, and to place compressors and mechanical equipment in sound-proof enclosures.

5.10.6-P6 Discourage noise sensitive uses, such as residences, hospitals, schools, libraries, and rest homes, from areas with high noise levels, and discourage high noise generating uses from areas adjacent to sensitive uses.

5.10.6-P7 Implement measures to reduce interior noise levels and restrict outdoor activities in areas subject to aircraft noise in order to make Office/Research and Development uses compatible with the Norman Y. Mineta International Airport land use restrictions.

City of Santa Clara Municipal Code. The City's Municipal Code establishes noise level performance standards for fixed sources of noise. Section 9.10.40 of the Municipal Code limits noise levels at multi-family residences to 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and 50 dBA at night (10:00 p.m. to 7:00 a.m.). The noise limits are not applicable to emergency work, licensed outdoor events, City-owned electric, water, and sewer utility system facilities, construction activities occurring within allowable hours, permitted fireworks displays, or permitted heliports. Construction activities are not permitted within 300 feet of residentially zoned property except within the hours of 7:00 a.m. and 6:00 p.m. on weekdays and 9:00 a.m. and 6:00 p.m. on Saturdays. No construction is permitted on Sundays or holidays.

The City Code does not define the acoustical time descriptor such as L_{eq} (the average noise level) or L_{max} (the maximum instantaneous noise level) that is associated with the above limits. A reasonable interpretation of the City Code would identify the ambient base noise level criteria as an average or median noise level (L_{eq}/L_{50}).

Existing Noise Environment

The project site is located to the south of El Camino Real between Scott Boulevard and Pierce Street in the City of Santa Clara. Single-family residences bound the site to the south and to the southeast, opposite Pierce Street. Commercial uses are located to the west, to the north, opposite El Camino Real, and to the east, opposite Pierce Street.

A noise monitoring survey was performed at the site beginning on Wednesday January 20, 2016 and concluding on Thursday January 21, 2016. The monitoring survey included two long-term and two short-term noise measurements, which are shown in Figure 1. The noise environment at the site and in the surrounding areas results primarily from vehicular traffic along El Camino Real. Traffic along the nearby side streets of Scott Boulevard and Pierce Street, as well as the

neighborhood traffic along Clay Street, also affects the ambient noise environment. Occasional overhead aircraft associated with the Mineta San José International Airport are also audible at times at the project site.

Long-term noise measurement LT-1 was made along the northern property line of the project site. The sound level meter was placed in a tree north of the existing car dealership office building, approximately 65 feet south of the centerline of El Camino Real. Hourly average noise levels at this location typically ranged from 70 to 74 dBA L_{eq} during the day, and from 58 to 69 dBA L_{eq} at night. The average community noise equivalent level from Wednesday January 20, 2016 through Thursday January 21, 2016 was 74 dBA CNEL. The daily trend in noise levels at LT-1 is shown in Figure 2.

LT-2 was made along the fence line at the rear of the project site, approximately 275 feet west of the centerline of Pierce Street. Hourly average noise levels at this location typically ranged from 55 to 65 dBA L_{eq} during the day, and from 46 to 57 dBA L_{eq} at night. The average community noise equivalent level from Wednesday January 20, 2016 through Thursday January 21, 2016 was 60 dBA CNEL. The daily trend in noise levels at LT-2 is shown in Figure 3.

Short-term noise measurements, ST-1 and ST-2, were conducted on Wednesday January 20, 2016 in ten-minute intervals starting at 12:00 p.m. and concluding at 12:30 p.m. As shown in Figure 1, ST-1 was made along the western boundary of the project site, near the existing fast-food drive-thru on the adjacent property. ST-1 was located behind the existing office building on the site, approximately 125 feet from the centerline of El Camino Real. While ST-1 was mostly shielded from traffic noise along El Camino Real, the short-term measurement provided data to characterize the noise generated at the drive-thru window and adjacent fast-food parking lot. ST-2 was made in front of the residence at 1535 Pierce Street, opposite Pierce Street from the project site. ST-2 was located approximately 25 feet from the centerline of Pierce Street and characterized the existing noise environment of the residential land uses to the east and to the south of the project site. Short-term measurements from ST-1 and ST-2 are summarized in Table 4.

FIGURE 1 Noise Measurement Locations

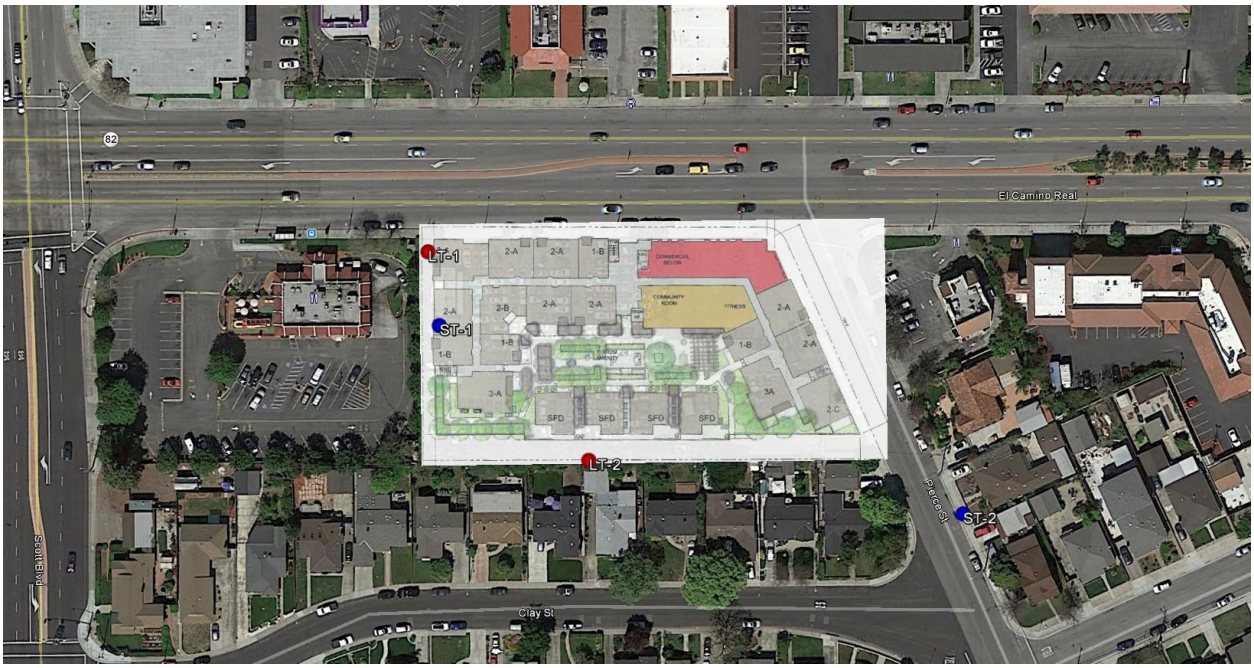


FIGURE 2 Daily Trend in Noise Levels at LT-1, Wednesday, January 20 through Thursday, January 21, 2016

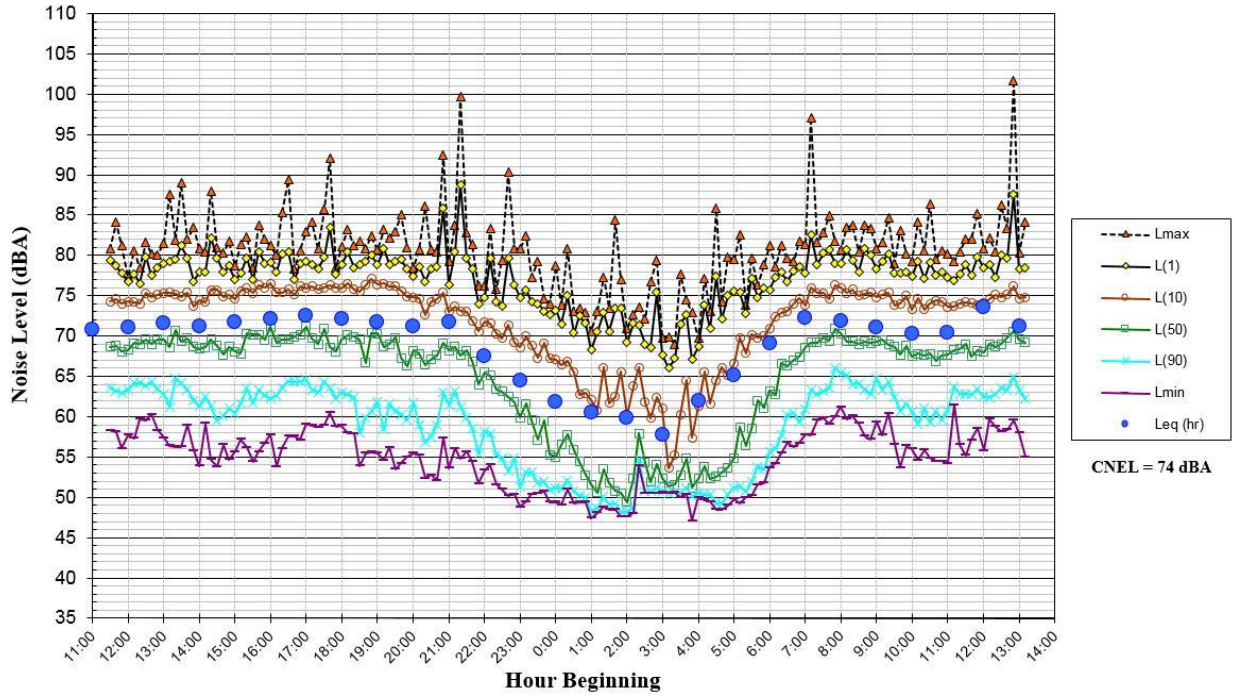


FIGURE 3 Daily Trend in Noise Levels at LT-2, Wednesday, January 20 through Thursday, January 21, 2016

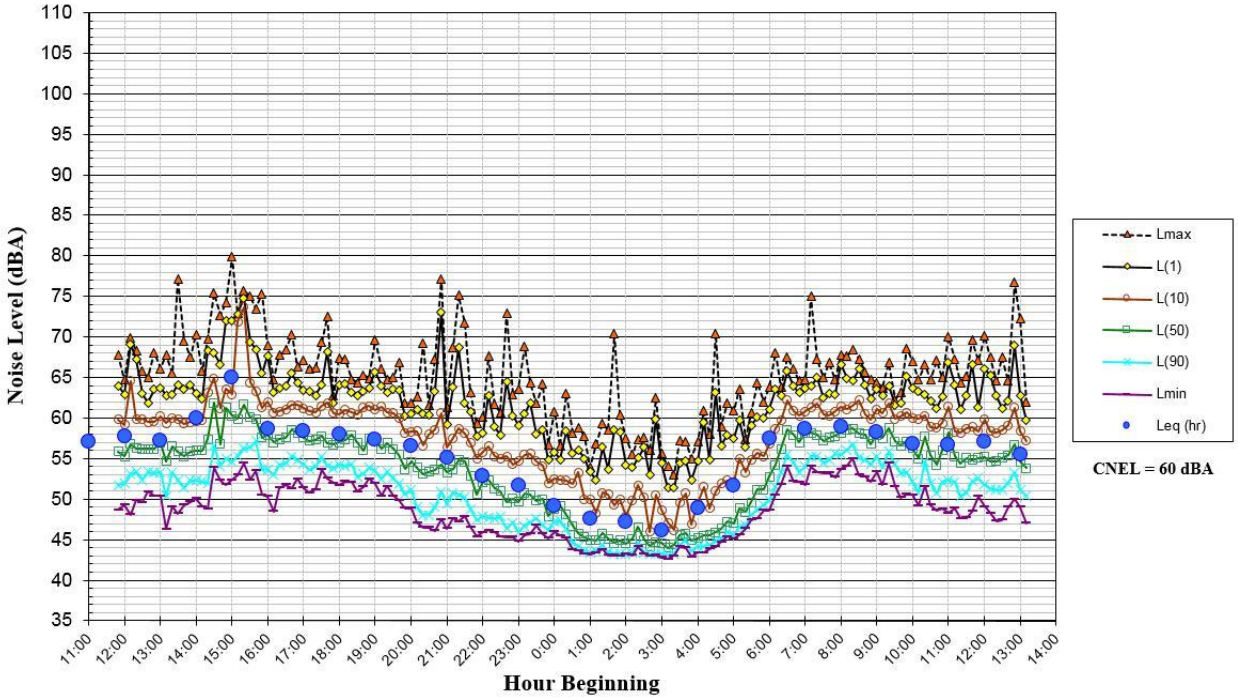


TABLE 4 Summary of Short-Term Noise Measurements (dBA)

Noise Measurement Location (Date, Time)	L_{max}	$L_{(1)}$	$L_{(10)}$	$L_{(50)}$	$L_{(90)}$	$L_{eq(10)}$	CNEL
ST-1: Near the existing fast-food drive-thru (1/20/2016, 12:00-12:10 p.m.)	70	67	65	60	55	61	64
ST-2: Front yard equivalent of 1535 Pierce Street (1/20/2016, 12:20-12:30 p.m.)	73	66	58	52	47	56	59

NOISE IMPACTS AND MITIGATION MEASURES

Significance Criteria

The following criteria were used to evaluate the significance of environmental noise resulting from the project:

- A significant noise impact would be identified if the project would expose persons to or generate noise levels that would exceed applicable noise standards presented in the General Plan or Municipal Code.
    - Residential uses are considered "normally acceptable" where exterior noise exposures are 55 dBA CNEL or less and interior noise levels are 45 dBA CNEL or less.

- A significant impact would be identified if the construction of the project would expose persons to excessive vibration levels. Ground-borne vibration levels exceeding 0.3 in/sec PPV would have the potential to result in cosmetic damage to normal buildings.

- A significant impact would be identified if traffic generated by the project or project improvements/operations would substantially increase noise levels at sensitive receivers in the vicinity. A substantial increase would occur if: a) the noise level increase is 5 dBA CNEL or greater, with a future noise level of less than 60 dBA CNEL, or b) the noise level increase is 3 dBA CNEL or greater, with a future noise level of 60 dBA CNEL or greater.

- A significant noise impact would be identified if construction-related noise would temporarily increase ambient noise levels at sensitive receptors. Hourly average noise levels exceeding 60 dBA $L_{eq,}$ and the ambient by at least 5 dBA L_{eq}, for a period of more than one year would constitute a significant temporary noise increase at adjacent residential land uses.

Impact 1: **Noise and Land Use Compatibility.** Future noise levels at the project site are not expected to exceed the City of Santa Clara's exterior noise land use compatibility standards at noise-sensitive outdoor use areas. Interior noise levels at the residential land uses are expected to exceed the 45 dBA CNEL threshold assuming standard construction methods and materials. **This is a significant impact.**

The proposed mixed-use project consists of a four-story building with commercial use and parking on the first floor and residential uses on floors two through four. Primary access to the proposed development would be from two driveways along Pierce Street.

Future Exterior Noise Environment

The future noise environment at the project site would continue to result primarily from traffic along El Camino Real. Based on a review of Appendix Seven: Transportation and Mobility Assumptions completed for the City of Santa Clara 2035 General Plan,[1] traffic volumes along the segment of El Camino Real between Scott Boulevard and Lincoln Street are projected to increase by as much as 20% by 2035. This traffic volume increase would result in a traffic noise increase of 1 dB by 2035. Additionally, *Hexagon Transportation Consultants, Inc.* completed a traffic operations analysis for the proposed mixed-use project.[2] From this study, the peak hour trips generated by the proposed project would result in a net increase of 30 AM peak hour trips and 35 PM peak hour trips. These project-generated trips would be insignificant compared to the traffic volumes along El Camino Real. The noise level increase due to the project would be less than 1 dB. Therefore, worst-case scenario future traffic conditions would result in a noise level increase at the proposed project site of 1 dB by the year 2035. Based on measurements made at

[1] "City of Santa Clara General Plan, Appendix Seven: Transportation and Mobility Assumptions," 2008.
[2] *Hexagon Transportation Consultants, Inc.*, "Traffic Operations Analysis for the Proposed Mixed-Use Project Located at 1890 El Camino Real in Santa Clara, California, December 2015.

LT-1, future exterior noise levels at a distance of 65 feet from the centerline of El Camino Real would be 75 dBA CNEL in 2035.

The project site plan identifies a podium-level courtyard located on the interior of the project site as the only common outdoor use area. This courtyard would be shielded from traffic along El Camino Real and the other surrounding roadways by the proposed residential building. The future exterior noise levels at the outdoor use area would be less than 55 dBA CNEL. While the residential units may have private terraces, balconies, or roof decks facing adjacent roadways, these small outdoor use areas are not typically considered sensitive to exterior noise levels and are not included as part of this analysis.

Noise levels in outdoor use areas that are affected by transportation noise are required to be maintained at or below 55 dBA CNEL to be considered normally acceptable for residential land uses, according to the City's General Plan. The future calculated noise levels at the podium-level courtyard would not exceed this threshold. This would be a less-than-significant impact.

Future Interior Noise Environment

Proposed Commercial Land Uses

The State of California requires that wall and roof-ceiling assemblies of commercial buildings exposed to the adjacent roadways have a composite Sound Transmission Class (STC)[3] rating of at least 50 or a composite Outdoor-Indoor Transmission Class (OITC) rating of no less than 40, with exterior windows of a minimum STC of 40 or OITC of 30 when the commercial property falls within the 65 dBA CNEL noise contour of a roadway. According to the City's General Plan, the commercial land uses are adjacent to El Camino Real and would be within the 65 and 70 dBA CNEL contour line. The State also requires interior noise levels to be maintained at 50 dBA $L_{eq(1\text{-}hr)}$ or less during hours of operation at the proposed commercial building.

The commercial land use at the proposed project site would be set back from El Camino Real by 60 to 100 feet along the northern and eastern building façades. At these distances, the commercial use would be exposed to future daytime hourly average noise levels ranging from 69 to 75 dBA $L_{eq(1\text{-}hr)}$. A wall assembly with an STC rating of at least 50 and window assemblies with an STC rating of at least 40 would provide at least 35 to 40 dBA of noise reduction in interior spaces. The inclusion of adequate forced-air mechanical ventilation systems is normally required so windows may be kept closed at the occupant's discretion. The sound-rated construction materials established in the Cal Green Code in combination with forced-air mechanical ventilation would satisfy the threshold for the commercial land use.

Proposed Residential Land Uses

The City of Santa Clara requires that interior noise levels be maintained at 45 dBA CNEL or less for residences.

[3] **Sound Transmission Class (STC)** A single figure rating designed to give an estimate of the sound insulation properties of a partition. Numerically, STC represents the number of decibels of speech sound reduction from one side of the partition to the other. The STC is intended for use when speech and office noise constitute the principal noise problem.

The nearest residential units facing El Camino Real would be set back approximately 60 feet south of the centerline. At this distance, the exterior-facing walls of the residential units would be exposed to future exterior noise levels of 75 dBA CNEL.

Along the western façade of the proposed building, the units with direct line-of- sight to El Camino Real would have setbacks from the centerline ranging from 60 to 165 feet. At these distances, the units would be exposed to future exterior noise levels ranging from 70 to 75 dBA CNEL. Additionally, the exterior-facing units along the western façade would also be exposed to fast-food drive-thru activity from the adjacent property. The measured noise level for the adjacent fast-food restaurant building and drive-thru was 64 dBA CNEL, as shown in Table 4 at ST-1. While fast-food restaurant related noises, such as placing orders through the intercom, idling engines, etc., may at times be audible at the proposed project site, the noise levels are significantly lower than the ambient traffic noise levels from El Camino Real.

The units along the eastern façade would have direct line-of- sight to El Camino Real, with setbacks ranging from 60 to 210 feet, and to Pierce Street, with setbacks of 25 feet. The proposed residential units along the eastern building façade would be exposed to future exterior noise levels ranging from 68 to 75 dBA CNEL.

While the residential units along the southern boundary of the project site would be shielded from traffic noise along El Camino Real by the proposed building, these units would have direct line-of-sight to Pierce Street, with setbacks ranging from 25 to 300 feet. At these distances, the southern-facing units would be exposed to future exterior noise levels ranging from below 60 to 68 dBA CNEL. Unit 3-A, which would be located in the southwestern corner of the project site would be mostly shielded from the traffic noise along the surrounding roadways by the adjacent units; however, the western edge could be exposed to future exterior noise levels up to 65 dBA CNEL at the southernmost corner.

Units on the interior of the property that overlook the podium-level courtyard would receive adequate shielding from the intervening building façades. These units would be exposed to future exterior noise levels below 60 dBA CNEL.

Interior noise levels would vary depending upon the design of the buildings (relative window area to wall area) and the selected construction materials and methods. Standard residential construction provides approximately 15 dBA of exterior to interior noise reduction, assuming the windows are partially open for ventilation. Standard construction with the windows closed provides approximately 20 to 25 dBA of noise reduction in interior spaces. Where exterior noise levels range from 60 to 65 dBA CNEL, the inclusion of adequate forced-air mechanical ventilation is often the method selected to reduce interior noise levels to acceptable levels by closing the windows to control noise. Where noise levels exceed 65 dBA CNEL, forced-air mechanical ventilation systems and sound-rated construction methods are normally required. Such methods or materials may include a combination of smaller window and door sizes as a percentage of the total building façade facing the noise source, sound-rated windows and doors, sound rated exterior wall assemblies, and mechanical ventilation so windows may be kept closed at the occupant’s discretion.

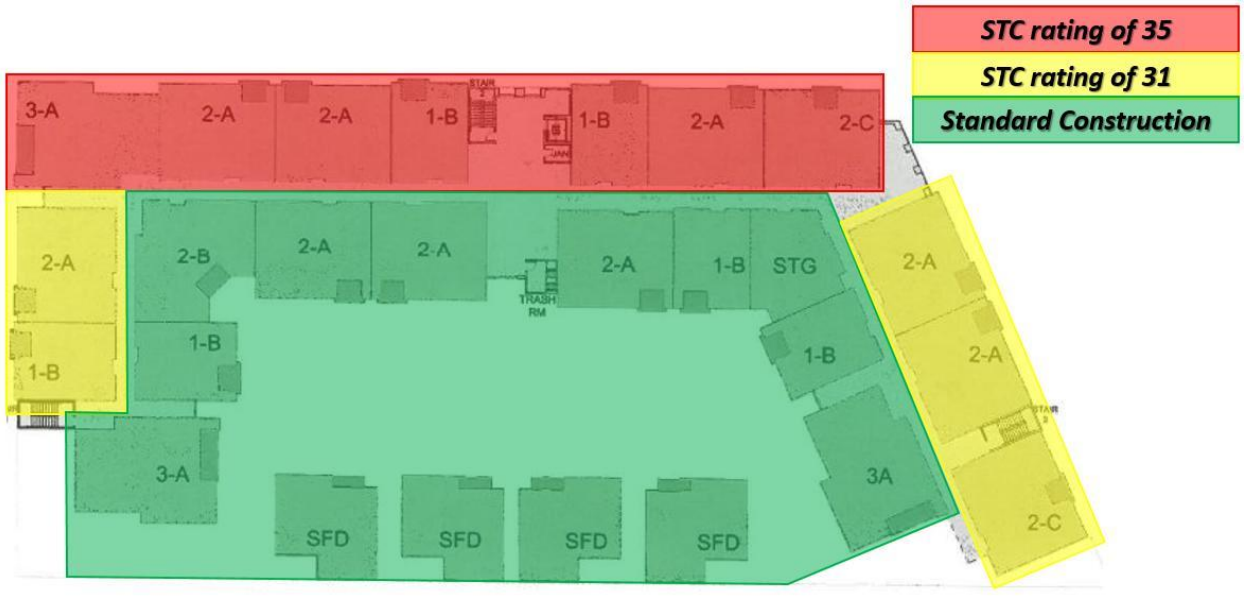
For the proposed project, the interior noise levels would be up to 60 dBA CNEL, which exceeds the City's threshold for interior noise. This would be a significant impact and require mitigation.

Mitigation Measure 1:

The following mitigation measures shall be incorporated into the proposed project to reduce interior noise levels at 45 dBA CNEL or below:

- Based on a review of the residential building floor plans and elevations provided at the time of this analysis, preliminary calculations indicate that exterior-facing units along the northern building façade would require windows and doors with a minimum STC rating of 35 with adequate forced-air mechanical ventilation to meet the interior noise threshold established by the City. The units along the eastern and western building façades would require windows and doors with a minimum STC rating of 31. Standard construction materials with the incorporation of forced-air mechanical ventilation would be adequate for the residential units on the interior of the site with no direct line-of-site to El Camino Real. See Figure 4 for the required minimum STC ratings.

FIGURE 4 Window and Door STC Requirements for the Proposed Project



- Provide a suitable form of forced-air mechanical ventilation, as determined by the local building official, for all units on the project site, so that windows can be kept closed at the occupant's discretion to control interior noise and achieve the interior noise standards.

- A qualified acoustical consultant shall review the final site plan, building elevations, and floor plans prior to construction and recommend building treatments to reduce interior noise levels to 45 dBA CNEL or lower. Treatments would include, but are not limited to, sound-rated windows and doors, sound-rated wall and window constructions, acoustical caulking, protected ventilation openings, etc. The specific determination of what noise insulation treatments are necessary shall be conducted during final design of the project.

Results of the analysis, including the description of the necessary noise control treatments, shall be submitted to the City, along with the building plans and approved design, prior to issuance of a building permit.

Impact 2: **Exposure to Excessive Ground-borne Vibration.** Construction-related vibration caused by some types of construction activity could be in excess of 0.3 in/sec PPV at the existing residences located adjacent to the project site. **This is a significant impact.**

The construction of the project may generate perceptible vibration when heavy equipment or impact tools (e.g. jackhammers, hoe rams) are used. Construction activities would include site demolition, preparation work, foundation work, and new building framing and finishing. The proposed project would not require pile driving, which can cause excessive vibration.

For structural damage, the California Department of Transportation recommends a vibration limit of 0.5 in/sec PPV for buildings structurally sound and designed to modern engineering standards, which typically consist of buildings constructed since the 1990s. A conservative vibration limit of 0.3 in/sec PPV has been used for buildings that are found to be structurally sound but where structural damage is a major concern (see Table 3 above for further explanation). For historical buildings or buildings that are documented to be structurally weakened, a conservative limit of 0.08 in/sec PPV is often used to provide the highest level of protection. While no historical buildings or buildings that are documented to be structurally weakened adjoin the project site, details regarding the residences surrounding the project site were not provided at the time of this study. For the purposes of this study, therefore, ground-borne vibration levels exceeding the conservative 0.3 in/sec PPV limit would have the potential to result in a significant vibration impact.

Table 5 presents typical vibration levels that could be expected from construction equipment at a distance of 25 feet. Project construction activities, such as drilling, the use of jackhammers, rock drills and other high-power or vibratory tools, and rolling stock equipment (tracked vehicles, compactors, etc.) may generate substantial vibration in the immediate vicinity. Vibration levels would vary depending on soil conditions, construction methods, and equipment used. Residential dwellings are located adjacent to the project site along the southern boundary, as well as to the east, opposite Pierce Street. The adjacent residences to the south are approximately 5 to 35 feet from the shared property line, and vibration levels would be expected to be up to 1.23 in/sec PPV, which exceeds the 0.3 in/sec PPV significance threshold. The nearest single-family residences to the east are approximately 70 to 75 feet from the project property line. At these distances, vibration levels would be expected to be below 0.1 in/sec PPV. Construction activity for the proposed project could potentially result in “architectural” damage to the adjacent residences. This is a significant impact.

TABLE 5 Vibration Source Levels for Construction Equipment

Equipment		PPV at 25 ft. (in/sec)	Approximate L_v at 25 ft. (VdB)
Pile Driver (Impact)	upper range	1.158	112
	typical	0.644	104
Pile Driver (Sonic)	upper range	0.734	105
	typical	0.170	93
Clam shovel drop		0.202	94
Hydromill (slurry wall)	in soil	0.008	66
	in rock	0.017	75
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drilling		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Transit Noise and Vibration Impact Assessment, United States Department of Transportation, Office of Planning and Environment, Federal Transit Administration, May 2006.

Mitigation Measure 2:

Prohibit the use of heavy vibration-generating construction equipment, such as vibratory rollers or the dropping of heavy objects, within 20 feet of any adjacent residences.

The implementation of this mitigation measure would reduce the impact to a less-than-significant level.

Impact 3: **Project-Generated Traffic Noise.** The proposed project would not result in a permanent noise level increase at the existing residential land uses in the project vicinity. **This is a less-than-significant impact.**

A significant impact would occur if the permanent noise level increase due to project-generated traffic was 3 dBA CNEL or greater for ambient noise levels exceeding 60 dBA CNEL or was 5 dBA CNEL or greater for ambient noise levels at or below 60 dBA CNEL. Existing noise-sensitive receptors are located to the south and southeast of the project site, opposite Pierce Street. LT-2 and ST-2 represented the ambient noise environment of these nearby sensitive receptors. Since the ambient noise environment at these locations would be 60 to 61 dBA CNEL in the year 2035, a significant impact would occur if project-generated traffic would increase these levels by 3 dBA CNEL.

The noise environment surrounding the project site is dominated by El Camino Real, but the nearby residences would be mostly shielded from traffic along this roadway. Therefore, Pierce Street and the neighborhood roadways would affect the noise environment of the nearby residences. According to the site plan, access to the proposed project site would be from driveways along Pierce Street. To determine the effect of the project-generated traffic on the

nearby existing residences, the Existing Plus Project traffic volumes included in the traffic study by *Hexagon Transportation Consultants* was compared to the Existing traffic volumes. While the traffic volume along Pierce Street would double with the proposed project, the traffic volume on this roadway is insignificant compared to the traffic volume along El Camino Real. Furthermore, most of the project-generated traffic along Pierce Street is expected between the access driveways and El Camino Real, not as far south as the existing single-family residences. The noise level increase calculated at the nearest residence to the project site would be less than 1 dBA. Therefore, the project-generated traffic would not cause a permanent noise increase at the surrounding noise-sensitive receptors. This impact is a less-than-significant impact.

Mitigation Measure 3: **None required.**

Impact 4: **Project-Generated Mechanical Noise.** The proposed project could generate noise in excess of the City's exterior noise guidelines for fixed sources of noise. The proposed project would, therefore, potentially expose noise-sensitive receptors to and generate noise levels in excess of the City's established guidelines. **This is a potentially significant impact.**

The proposed project would include mechanical equipment, such as heating, ventilation, and air conditioning systems. Under the City of Santa Clara Municipal Code, noise generated by fixed sources of noise would be restricted to 55 dBA during daytime hours (7:00 a.m. to 10:00 p.m.) and to 50 dBA during nighttime hours (10:00 p.m. to 7:00 a.m.) at residential land uses. Information regarding the number, type, and size of the mechanical equipment units to be used in the proposed project was not available at the time of this study. The site plans provided information regarding some electrical and utility closets on the first floor, as well as a "mechanical well" on the rooftop, assumingly the location of various mechanical equipment. Without detailed information, calculations cannot be made regarding noise levels at nearby sensitive receptors. Noise from mechanical equipment was therefore conservatively identified as a potentially significant impact.

Mitigation Measure 4:

Due to the number of variables inherent in the mechanical equipment needs of the project (number and type of units, locations for each unit, size, housing or enclosures, etc.), the impacts of mechanical equipment noise on nearby noise-sensitive uses shall be assessed during the final stage of project design. Design planning shall take into account the noise criteria associated with such equipment and use site planning to locate equipment in less noise-sensitive areas, where feasible. Other controls could include, but shall not be limited to, fan silencers, enclosures, and screen walls.

An acoustical study shall be prepared during final project design to evaluate the potential noise generated by building mechanical equipment and to identify the necessary noise controls that are included in the design to meet the City's 55 dBA daytime and 50 dBA nighttime noise limits. The study shall be submitted to the City of Santa Clara for review and approval prior to issuance of any building permits. Implementation of these mitigation measures would reduce this impact to a less-than-significant level.

Impact 5: **Temporary Construction Noise.** Existing noise-sensitive land uses would not be exposed to construction noise levels in excess of the significance thresholds for a period of more than one year. **This is a less-than-significant impact**.

Noise impacts resulting from construction depend upon the noise generated by various pieces of construction equipment, the timing and duration of noise-generating activities, and the distance between construction noise sources and noise-sensitive areas. Construction noise impacts primarily result when construction activities occur during noise-sensitive times of the day (e.g., early morning, evening, or nighttime hours), when the construction occurs in areas immediately adjoining noise-sensitive land uses, or when construction lasts over extended periods of time. Where noise from construction activities exceeds 60 dBA L_{eq} and exceeds the ambient noise environment by at least 5 dBA L_{eq} at noise-sensitive uses in the project vicinity for a period exceeding one year, the impact would be considered significant.

Construction activities generate considerable amounts of noise, especially during earth-moving activities when heavy equipment is used. The highest maximum noise levels generated by project construction would typically range from about 80 to 90 dBA L_{max} at a distance of 50 feet from the noise source (Table 6). Typical hourly average construction-generated noise levels for residential mixed-use developments are about 81 to 88 dBA L_{eq} measured at a distance of 50 feet from the center of the site during busy construction periods (e.g., earth moving equipment, impact tools, etc.). Hourly average construction noise levels associated with the erection of the structures, such as hammer- and drilling-related noise, range from approximately 63 to 71 dBA at a distance of 50 feet. The noise levels associated with construction of the building would be substantially less than the noise levels associated with grading and pavement activities during project site preparation. Construction-generated noise levels drop off at a rate of about 6 dBA per doubling of the distance between the source and receptor. Shielding by buildings or terrain can provide an additional 5 to 10 dBA noise reduction at distant receptors.

From demolition to completion, the total time duration expected for the proposed project would be approximately six to nine months. The highest noise levels would be generated during demolition, site preparation, excavation, grading, and trenching. Heavy construction equipment used to complete these tasks would include a concrete/industrial saw, excavators, a rubber-tired dozer, loaders, tractors, backhoes, graders, cranes, forklifts, generators, welders, air compressors, aerial lift, pavers, cement and mortar mixers, rollers, paving equipment, scrapers, trenching equipment, and dump trucks. Noise generated during the construction of the proposed structures is generally lower as less heavy construction equipment is required to complete the task. Once construction moves indoors, minimal noise would be generated at off-site locations.

The nearest existing residential structures are located approximately 5 to 35 feet south of the project site and would be exposed to hourly average noise levels ranging from 91 to 108 dBA L_{eq} during the busiest construction periods along the nearest shared boundary of the site. At residences to the east, which would be at approximately 70 to 75 feet from project boundary, construction noise levels would range from about 77 to 85 dBA L_{eq} during the busiest periods where construction occurs along the eastern boundary of the site.

TABLE 6 Construction Equipment, 50-foot Noise Emission Limits

Equipment Category	L_{max} Level (dBA)[1,2]	Impact/Continuous
Arc Welder	73	Continuous
Auger Drill Rig	85	Continuous
Backhoe	80	Continuous
Bar Bender	80	Continuous
Boring Jack Power Unit	80	Continuous
Chain Saw	85	Continuous
Compressor[3]	70	Continuous
Compressor (other)	80	Continuous
Concrete Mixer	85	Continuous
Concrete Pump	82	Continuous
Concrete Saw	90	Continuous
Concrete Vibrator	80	Continuous
Crane	85	Continuous
Dozer	85	Continuous
Excavator	85	Continuous
Front End Loader	80	Continuous
Generator	82	Continuous
Generator (25 KVA or less)	70	Continuous
Gradall	85	Continuous
Grader	85	Continuous
Grinder Saw	85	Continuous
Horizontal Boring Hydro Jack	80	Continuous
Hydra Break Ram	90	Impact
Impact Pile Driver	105	Impact
Insitu Soil Sampling Rig	84	Continuous
Jackhammer	85	Impact
Mounted Impact Hammer (hoe ram)	90	Impact
Paver	85	Continuous
Pneumatic Tools	85	Continuous
Pumps	77	Continuous
Rock Drill	85	Continuous
Scraper	85	Continuous
Slurry Trenching Machine	82	Continuous
Soil Mix Drill Rig	80	Continuous
Street Sweeper	80	Continuous
Tractor	84	Continuous
Truck (dump, delivery)	84	Continuous
Vacuum Excavator Truck (vac-truck)	85	Continuous
Vibratory Compactor	80	Continuous
Vibratory Pile Driver	95	Continuous
All other equipment with engines larger than 5 HP	85	Continuous

Notes: [1] Measured at 50 feet from the construction equipment, with a "slow" (1 sec.) time constant.

[2] Noise limits apply to total noise emitted from equipment and associated components operating at full power while engaged in its intended operation.

[3]Portable Air Compressor rated at 75 cfm or greater and that operates at greater than 50 psi.

Reasonable regulation of the hours of construction, as well as regulation of the arrival and operation of heavy equipment and the delivery of construction material, are necessary to protect the health and safety of persons, promote the general welfare of the community, and maintain the quality of life. Noise generated by project construction would not be expected to exceed 60 dBA L_{eq} and exceed ambient noise levels at receivers to the south and east by more than 5 dBA L_{eq} for a period greater than one year, resulting in a less-than-significant impact.

Construction equipment should be well-maintained and used judiciously to be as quiet as possible. Additionally, the following construction best management practices are recommended to reduce construction noise levels emanating from the site and minimize disruption and annoyance at existing noise-sensitive receptors in the project vicinity.

Construction Best Management Practices

Develop a construction noise control plan, including, but not limited to, the following available controls:

- Ensure that construction activities (including the loading and unloading of materials and truck movements) within 300 feet of residentially zoned property are limited to the hours of 7:00 a.m. to 6:00 p.m. on weekdays and between the hours of 9:00 a.m. and 6:00 p.m. on Saturdays. No construction is permitted on Sundays or holidays.

- Ensure that excavating, grading and filling activities (including warming of equipment motors) within 300 feet of residentially zoned property are limited to the hours of 7:00 a.m. to 6:00 p.m. on weekdays and between the hours of 9:00 a.m. and 6:00 p.m. on Saturdays. No construction is permitted on Sundays or holidays.

- Contractors equip all internal combustion engine-driven equipment with mufflers, which are in good condition and appropriate for the equipment.

- Contractors utilize “quiet” models of air compressors and other stationary noise sources where technology exists.

- Locate loading, staging areas, stationary noise-generating equipment, etc. as far as feasible from sensitive receptors when sensitive receptors adjoin or are near a construction project area. Construct temporary noise barriers to screen stationary noise-generating equipment when located near adjoining sensitive land uses. Temporary noise barriers could reduce construction noise levels by 5 dBA.

- Control noise from construction workers’ radios to a point where they are not audible at existing residences bordering the project site.

- Comply with Air Resource Board idling prohibitions of uneasy idling of internal combustion engines.

- Construct solid plywood fences around construction sites adjacent to operational business, residences or noise-sensitive land uses.

- A temporary noise control blanket barrier could be erected, if necessary, along building facades facing construction sites. This mitigation would only be necessary if conflicts occurred which were irresolvable by proper scheduling.

- Route construction-related traffic along major roadways and as far as feasible from sensitive receptors.

- Businesses, residences or noise-sensitive land uses adjacent to construction sites should be notified of the construction schedule in writing. Designate a "construction liaison" that would be responsible for responding to any local complaints about construction noise. The liaison would determine the cause of the noise complaints (e.g., starting too early, bad muffler, etc.) and institute reasonable measures to correct the problem. Conspicuously post a telephone number for the liaison at the construction site.

Implementation of these measures would reduce construction noise levels emanating from the site, limit construction hours, and minimize disruption and annoyance. With the implementation of these measures, the lack of high-intensity construction equipment required for the proposed project, and the fact that noise generated by construction activities would occur over a temporary period, the temporary increase in ambient noise levels at this new development site would be a less-than-significant impact.

Mitigation Measure 5: **None required.**

Impact 6: **Noise and Land Use Compatibility (Aircraft).** The proposed project would be located in a compatible noise environment with respect to noise generated by Mineta San José International Airport. **This is a less-than-significant impact**.

Mineta San José International Airport is a public-use airport located approximately 1.4 miles northeast of the project site. Although aircraft-related noise could occasionally be audible at the project site, noise from aircraft would not substantially increase ambient noise levels. The project site lies outside the 2017 and 2027 noise contours shown in the Norman Y. Mineta San José International Airport Master Plan Update Project report published in February 2010 as an addendum to the Environmental Impact Report. Exterior and interior noise levels resulting from aircraft would be compatible with the proposed project. This is a less-than-significant impact.

Mitigation Measure 6: **None Required.**